

**NAVAL WAR COLLEGE**

**THEATER MISSILE DEFENSE**

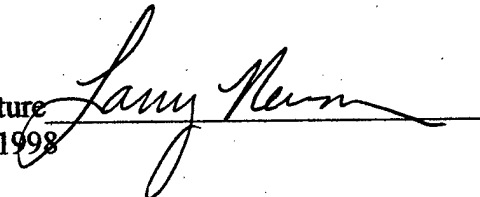
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**The contents of this paper reflect my own personal views and are not necessarily  
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## **Theater Missile Defense**

It was October 27, 2015 AD. The Commander in Chief (CINC) for Pacific Command (PACOM) observed the new laser equipped armored vehicles being off loaded from one of the Navy's new Fast Surface Supply Ships (FSSS) capable of sustaining 50 Knots. He thought to himself that it felt good to get some heavy forces on the ground. War was less complicated when he was a Captain during Desert Storm. It had taken almost a month to get a Theater Missile Defense (TMD) system in place to allow for safe off loading at the ports in Taiwan. He had initially wanted to forgo the recommendations to establish the TMD system. He thought it was a risk worth taking, at least initially. He had wanted to buildup combat power as soon as possible and get on with what he thought was an inevitable war. He knew that the Joint Forces Air Component Commander had focused a lot of time, resources and effort on finding and neutralizing mobile missile launchers. His Theater Army Air Defense Coordinator (TAACORD) had recommended to establish a Theater Ballistic Missile (TBM) defense prior to anything going ashore. The decision was right because as soon as troops and equipment started moving ashore both ballistic missiles and cruise missiles began their way south with the port as their primary target. As good as our Armed Forces were, they still had trouble locating a Transporter Erector Launcher (TEL), simply a truck with a missile on it. We still had to rely on active defense to counter the missile threat. It would have set the operation back months had the two tiered TBM defense not been in place and operational to intercept those inbound missiles.

The scene at the port was one that he nor any other CINC had seen before. An Aegis Cruiser was about ten miles off shore equipped with the new Block IVA Lower

Tier system; its primary mission was to protect the ports. Another Aegis cruiser equipped with the new Theater Wide Upper Tier system was farther north in the straits trying to kill missiles high in space prior to their descent, hopefully destroying them over enemy territory. Two Air Force Airborne Laser equipped airplanes deployed shortly after and alternated flying mission providing continuous coverage. Their mission was to kill the TBMs in their boost phase prior to entering friendly territory. The Marines that landed weeks ago had brought their antiquated HAWK system, a venerable system that had been upgraded to allow a minimum TBM capability. It wasn't much, but it offered protection until the remainder of the system could be deployed. In fact, the marine corps HAWK was the first to fire in the operation engaging and destroying a cruise missile. The Army entered the theater next with a very robust ground based TBM system. Both the newly fielded Medium Extended Air Defense System (MEADS) and the Theater High Altitude Air Defense (THAAD) system joined the already battle tested Patriot system. Although he couldn't see them, he knew both Patriot and MEADS units were well forward to provide force protection for the units as they occupied their forward defensive positions. To date, these systems had accounted for 33 missiles of various types, several of which were known to have Chemical warheads. Discounting the WMD effects, the American people's will could not have handled the ramifications of that many missiles landing on or near their sons and daughters. This operation would have been short lived had those missiles reached their objective.

The network that was created by these systems was impressive. An Aerostat floated lazily overhead tethered to a 2000 ft data cable. It was searching for low flying cruise missiles and feeding that data to all HAWK, MEADS, PATRIOT and THAAD

units in the theater. Forward Area Air Defense (FAAD), units supporting the maneuver forces, equipped with Avenger and Linebacker short range systems received this data to provide defense against cruise missiles that manage to get through the near leak proof defense. It was also feeding that data to the Upper and Lower Tier Aegis Cruisers and the Air Force Airborne Laser flying a racetrack pattern at 20,000 feet. Satellites stationed over the area fed launch data to the network. Every system from each service had the same picture, a mammoth feat in interoperability. Additionally, all fire unit movement and positioning was controlled by the Army Air and Missile Defense Command (AAMDC) that was under his command at his level, where it should be. His Joint Forces Air Component Commander (JFACC) controlled the alert and weapon's status, but did it in concert with the AAMDC commander to allow the TMD systems the flexibility to engage TBMs automatically. Fratricide is not really an issue because there is no such thing as an incoming friendly TBM. It was almost too much for the mind to comprehend.

## **Thesis**

The proliferation of missile and WMD technologies around the world makes effective TMD a critical prerequisite for successful joint operations. The mere presence of hostile theater missile capabilities in an operational area, especially if they pose a WMD threat, creates a significant challenge for the operational commander. Future CINCs will have no choice but to plan for Theater Missile Defense if they are operating in an area where the enemy is equipped with theater missiles. A single service can not do it alone; it must be joint to succeed. Each service is developing useful active defense

systems that, individually do not provide the total solution. We must find a way to integrate these systems into a coherent whole to counter the growing TM threat.

### **The Threat**

The future threat will drive a CINC to send in a TMD system prior to substantial amounts of combat power. Furthermore the scenario mentioned above could possibly come true in the future. It is clear that the future 3<sup>rd</sup> dimension threat will be unmanned. The United States is the only super power in the world with no other large peer competitor on the horizon, even in as late as 2015. The results of Desert Storm proved how ineffective conventional forces, including manned aircraft, are against our forces. Theater missiles were the only weapon that we couldn't defeat; it was Iraq's only success against the allied coalition. As we move toward a more modern digitized armed force the gap between us and a likely adversary will widen. Future opponents will likely rely on asymmetrical methods for attacking US forces, including TBMs, much the way Saddam Hussein did during Desert Storm.

In the cold war era the primary air threat was manned fixed and rotary wing aircraft. Missiles were a part of the threat, but took a back seat to the air breathing threat. This paradigm has started changing and will continue to change until virtually all our prospective opponents switch to some type of unmanned aerial vehicles. Without sponsorship in the form of subsidized weapons, there is little likelihood that a regional foe will have the money to develop traditional air forces capable of meeting and defeating a future Joint Task Force. To highlight this point, suppose an aggressor had 50 million dollars to spend on some type of air power. He could purchase one or two Superior Fixed Wing Fighters, or four Attack Helicopters, or ten Utility Helicopters, or

fifteen Theater Ballistic Missiles with three mobile launchers, or one hundred attack/reconnaissance UAVs, or one hundred plus off-the-shelf Cruise Missiles.<sup>1</sup> US and friendly airpower has the capability to establish air superiority early in the conflict if the first two systems are purchased; they will probably lose those aircraft either on the ground or in the air. Purchasing theater missiles appears to be a better way to attack US forces. Currently, the only weapon system we currently have capable of engaging TBMs is PATRIOT. We have very little capability against UAVs and even less against Cruise Missiles. Theater missiles have become a poor man's air force. The perception, and in some cases the truth, is that we can't defend ourselves against them. The widespread proliferation of these aerial platforms provides potential foes an affordable means to attack US forces and prevent a Joint Force Commander (JFC) from achieving its objectives.

There are several ways an opponent with a theater missile capability can use them against our forces. Military threats from theater missiles include but are not limited to: attacks on deployed US and multinational forces; interdiction of lines of communications; attacks on logistic facilities; and attacks on population centers. The TM threat may appear across the spectrum of military operations. Political targets for theater missiles include civilian population centers, political, cultural, and religious structures. In addition, propaganda value exists in attacking concentrations of US and multinational military forces attempt to breakup up coalitions much the way Iraq did

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<sup>1</sup> Headquarters, Department of the Army, Deputy Chief of Staff for Operations and Plans, Force Development, Air & Missile Defense Division, *Cruise Missile Defense*, An Army White Paper, September 1996, page 2-1.

during Desert Storm. Opponents that own a missile capability will likely use them against us.

### **Current Theater Missile Defense Doctrine**

For the purpose of fighting future theater missile wars, the definition of theater missile and theater missile defense will remain the same. Currently Theater Missiles (TMs) are defined as "ballistic missiles, cruise missiles and air-to-surface missiles whose targets are within a given theater of operation."<sup>2</sup> Theater Missile defense is defined as the "identification, integration, and employment of forces supported by theater and national capabilities to detect, identify, locate, track, minimize the effects of, and/or destroy enemy theater missiles."<sup>3</sup> "TMD is inherently a joint mission. During the planning stage, TMD forces, requirements, and capabilities must be integrated into all phases of the operation and mission areas early on. Joint theater missile defense (JTMD) systems and procedures must be adaptable for joint or multinational operations in any contingency."<sup>4</sup>

Theater missile defense is composed of four operational elements: passive defense, active defense, attack operations, and command, control, communications, computers and intelligence (C4I).

**-Passive defense** - measures taken to posture the force to reduce vulnerability and minimize the effects of a TM attack.

**-Active defense** - operations taken to protect against a TM attack by destroying airborne TM airborne launch platforms and/or destroying TMs in flight.

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<sup>2</sup> The Joint Staff, Joint Publication 3-01.5, *Doctrine for Joint Theater Missile Defense*, 22 FEB 96, page vii.



**-Attack operations** - operations taken to destroy, disrupt, or neutralize TM launch platforms and their supporting structures and systems.

**-Command, control, communications, computers, and intelligence (C4I)** - systems used to coordinate and integrate the joint force capabilities to conduct and link passive defense, active defense, and attack operations.<sup>5</sup>

These four pillars serve as the doctrinal foundation for all TMD systems. Current systems should build on existing doctrine; future systems must incorporate the newest technology and doctrinal concepts. All TMD systems must integrate with the existing legacy systems and should be modular enough to be upgraded and remain interoperable with other systems.

The doctrinal purpose of TMD is to counter the TM threat by coordinating and integrating the four operational elements or pillars of TMD into cohesive and coherent combat operations, to create a near leak proof defense.<sup>6</sup> All four pillars are important. There are three terms or concepts that must be explained to understand a near leak proof Theater Missile Defense. The boost or ascent phase weapons system engages missiles shortly after launch destroying them over enemy territory. The second type system is called an upper tier system and it engages missiles at long-range and at high altitude; it also provides protection to a large area. These two concepts are extremely important when the threat has a WMD capability. The desired goal is to destroy inbound missiles

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<sup>3</sup> United States Army Air Defense Artillery School, FM 100-12, *Army Theater Missile Defense Operations*, Final Draft, FEB 96, page 1-2.

<sup>4</sup> Joint Pub 3-01.5 Page vii.

<sup>5</sup> Headquarters, Department of the Army, Field Manual 44-91, *Theater High Altitude Area Defense, Battalion and Battery Operations*, 20 SEP 97, page 1-3.

<sup>6</sup> A near leak proof defense varies from what I have read. The best definition I found was from Major Mike Lister, Chief of Doctrine, at The Air defense Artillery School and he defined it as 99% of all missiles engaged or neutralized prior to reaching its intended target.

over enemy territory or high in the atmosphere. The third is the lower tier systems which intercepts missiles that leak through the others tiers. This tier also provides force protection against cruise missiles and is more mobile capable of supporting troops on the move. It clearly takes all three to establish a near leakproof defense.

### **Current Command and Control**

Command and control is so important that the theater missile defense doctrinal community gave it a separate doctrinal pillar. For the purpose of this paper command and control is broken down into two distinct missions, one command and the other control. Parent units at Corps and below command their own respective active defense forces. The Army Air and Missile Defense Command (AAMDC) has command over all Echelon Above Corps (EAC) Army units assigned to a specific theater. This includes THAAD, Patriot and MEADS units. The parent organization or the AAMDC designates priorities for protection for organizations and activities. They decide where units are positioned based on TBM priorities. They do not control their respective units' fires. Additionally, the AAMDC commander normally accomplishes the duties and responsibilities of the TAACoord and is a member of the Army Forces (ARFOR) staff for planning, coordinating and executing air defense and missile defense at the theater Army level. Component commanders normally retain OPCON of their active defense forces or parcel them out to subordinate units to command. Either way is doctrinally acceptable.

The Area Air Defense Commander (AADC), normally an Air Force officer, is responsible for developing and coordinating weapons control measures and integrating the active air defense and the active missile plan. These provide the procedural

parameters within which component commanders can employ their assigned active defense forces to engage targets, including TBMs. This in effect is the control portion of the command and control. Normally, the AADC will be the component commander with the preponderance of active air defense, not necessarily TMD, capability and sufficient C2 capability to synchronize components' active defense operations. This structure is a relic of the cold war and is still used. The AADC could come from any service and it could change as the theater changes, but will normally be filled by an Air Force officer. Close coordination is required between the AADC and the JFACC to ensure the established procedures protect our aircraft. These procedural controls also apply to those TMD assets in the forward units under the command of the maneuver commanders.

No TMD command and control system would be effective without computers, communications and intelligence making it a C4I system. Automation exists throughout current and planned C2 systems to enhance performance and promote standardization, commonality and modularity. C4I supports the rapid fusion of data to meet the short execution timelines. Data is passed from unit to unit via a series of communications from the basic phone lines to tactical data links to satellite links. Intelligence is fed to the TMD system from a host of organic and national systems.

The proliferation of TMs throughout developing nations (particularly the proliferation of ballistic and cruise missiles, missile technology, and WMD technology) poses a new challenge to US military planners. Current Joint doctrine requires centralized planning. The process as delineated prescribed staffs starting with determining the threat by developing and Intelligence Preparation of the Battlefield (IPB). The next step is establishing defensive priorities & defense design and establish

airspace control measures along with a method of control, normally procedural. Lastly establish Rules of engagement and integrate the TM portion of the defense with the overall theater air defense to complete the integrated Air Defense System (IADS). Future planning doctrine must facilitate rapid TM engagement.

### **The Systems**

Each service is planning on entering the future Theater Missile fight. The paragraphs below briefly describe the planned systems and what their capabilities are. The majority of these systems have not been fielded and are in the various stages of development. It will take the entire cast to complete the Joint Theater Missile Defense.

The Air Force brings the Airborne Laser (ABL) to the TMD fight. The Airborne Laser will play a vital role in the nation's theater missile defense (TMD). The ABL will be the primary weapon used to attack TBMs during their boost phase, destroying them early in flight before their warheads have an opportunity to separate from the boost vehicle. Under this scheme, the warheads and destroyed missile components fall on enemy territory, making the aggressor's nation vulnerable to the effects of whatever warhead they employed. It fills a critical portion of the layered TMD defense architecture by attacking boosting TBMs. This capability provides a strong deterrence against the use of weapons of mass destruction. The ABL offers revolutionary warfighting capability, taking advantage of existing high energy laser and adaptive optics technology to field a flexible, robust, long-range, and affordable weapon system. It does not negate the need for the other systems.

The ABL is a rapid, self-deployable, long-range, weapon ready for immediate employment upon arriving in theater. The program will integrate a multi-megawatt

Chemical Oxygen Iodine Laser into a Boeing-747 aircraft to kill boosting TBMs at ranges in excess of several hundred kilometers. It will autonomously detect these threats with on-board infrared sensors, track them with highly accurate, low-power lasers, and fire its high-energy laser to destroy the missile. The high-energy laser beam control system, which uses adaptive optics and fast steering mirrors, will compensate for atmospheric effects and aircraft movement. The ABL will provide missile flight data to include estimated launch and impact points to other TMD architecture systems via an onboard communications suite. The ABL will have a salvo engagement capability, carrying enough chemical fuel to destroy 20 to 40 enemy missiles before refueling.<sup>7</sup> From its base in the continental U.S., the large 747-400 airframe carries all ground support, laser fuel, and support personnel needed to provide a rapid theater ballistic missile defense for deploying.

The Army's contribution comes in three systems Patriot, MEADS, THAAD and the AAMDC, the headquarters designed to tie the entire TMD system together, including the Navy and Air Force systems. Patriot is a point or limited area system designed originally to intercept aircraft. Significant upgrades and software changes have given it a very good lower tier capability. When armed with the new extended range interceptor (ERINT) hit to kill missile, the PATRIOT will be very effective. THAAD is an Army upper tier system that is ground based and will provide a wide area defense capability to the operational level commander. MEADS, which will eventually replace PATRIOT, is a lower tier multinational system that will defeat both TBM and cruise missiles. MEADS uses a ground based radar to detect TBMs and an aerial platform to detect cruise

missiles. This projected aerial platform is the tethered blimp-like aerostat housing a look down radar. An additional capability of MEADS allows it to import firing data from any other TBM system, a remarkable capability when a commander is trying to minimize radar emissions. All three systems are air transportable, but realistically should be transported by ships. When combined, the three systems provide the ground maneuver forces a viable TMD defense capability.

The Navy, along with the Marine Corps provides three systems for the TMD fight. The Aegis/ SM-2 Block IVA Area system provides a lower tier capability from the sea in support of forces that may have to fight their way into the theater. It also provides protection for coastal cities, airfields and ports. The Navy Theater Wide upper tier system is also sea based using the Standard Missile Lethal Atmospheric Projectile (SM-LEAP) and could provide extensive theater-wide protection, intercepting theater ballistic missiles outside the atmosphere as well as in the descent phase of a missile's flight.<sup>8</sup> Either of these systems are self-deployable on any Aegis cruiser.<sup>9</sup> The Marines bring a lower tier system called the HAWK, a short range air defense that has been modified to engage TBMs. This limited system is scheduled to be replaced by MEADS.

## **Conclusion**

Gone are the days when a CINC can send in TMD assets as an after thought much the way we did during the Gulf War. Plans were made to send a token TMD force to Saudi Arabia, but when Scuds started raining down on Riyadh things changed in a hurry. In addition to critical military assets like ports and airfields, the host nation wanted

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<sup>7</sup> ABL 1, Air Force Issues, United States Air Force Web Page, page 15.

<sup>8</sup> CDR Wayne F. Sweitzer, USN, *Battlespace Information, Command and Control (C2), Operational Intelligence, and Systems Integration*, JAN, 1998, Page 36.

protection also. No plans were made to send Patriot to Israel until she threaten to enter the war. Several units, with a minimum launch capability, were hastily deployed to both Saudi Arabia and Israel with the remainder of their units following on the first available transportation. This crisis management was caused by an enemy with a very limited missile capability. Future CINCs will not have the luxury to wait until after hostilities start to deploy.

There are several possible stumbling blocks that, if not corrected, could prevent the services from fielding and future CINCs from employing an effective theater missile defense system. Several changes must occur including Doctrine, ingrained attitudes and service parochialism. Doctrine as mentioned earlier says whoever has the necessary communications and computers to effectively control TMD gets it by default. Currently the US Army is the only service that has a system robust enough to Command and Control a theater size system. Albeit, each service has a limited capability that includes enough equipment to adequately control their respective forces. The Army acquired its current system to command and control its wide array of ground based counter air systems; it is expandable enough to add TMD. There is no theater level joint system. The solution is to make the Army Air and Missile Defense Command a Joint Air and Missile Defense Command (JAMDC) and make it a national level asset. When a CINC deploys, he takes the JAMDC with him. That headquarters serves as the CINC's planner and executor of the Theater Joint TM fight. Doctrine must come on line to reflect this.

The entrenched cold war attitude about Air Defense systems must change. The school of thought that TMD should always be assigned to one component commander or

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<sup>9</sup> United States Department of Defense, *U.S. Ballistic Missile Defense Programs*, OCT 94, page 3.

parceled out even lower is erroneous. Such a command structure would inhibit the rapid response required to neutralize the TM threat. This mentality was necessary during the cold war when we were expected to counter massive numbers of fixed and rotary wing aircraft. Theater missiles represent a real and growing threat that requires centralized planning and decentralized execution, which can't be accomplished if the units are parceled out to various headquarters. This does not mean that maneuver units will lose their support. It does mean that theater assets will no longer be pushed down to maneuver units. Countering the threat effectively demands the JFC to synchronize the capabilities with in his force, each unique but complementary.

Service parochialism can also prevent money going to where it is needed. Each service wants the mission of TMD; there is money to be spent in this new, growing community. However, there is never enough money to do everything everybody wants to do. In a time of zero growth in the budget, money that is added to fund a new program will have to come from other programs. Each service fights for as much money as it can possibly obtain, which may not be the right answer. For example, it may be difficult for the Air Force to realize that the future threat may not have pilots and as such will require less planes. Fewer planes means more money for other programs. There is no room in future warfare for service parochialism.

One could argue that TMD is not cost effective and that tactically TMs are military insignificant. During Desert Storm 88 Scuds rained on various targets and really did very little damage.<sup>10</sup> However, the amount of time spent chasing the mobile launchers to keep Israel out of the war was enormous. Chasing Scuds became a primary



mission and actually took aircraft away from the strategic bombing. I disagree with the argument that TMD is not cost effective. Had we had an effective TMD system developed, there would have been no question about Israel entering the war and the bombers could have performed their missions without being diverted to hunt Scuds. Theater missiles would have been one less thing for the CINC to worry about.

Clearly, theater missiles, particularly when armed with weapons of mass destruction, make it possible for a potential to drive the costs of military action to a level where the United States may not be able to afford the political, diplomatic and human price. Over 100 countries possess some form of theater ballistic missile capability. Currently 78 countries have cruise missiles. Nineteen countries export cruise missiles with France's Apache being the likely weapon of choice in the early 21<sup>st</sup> century.<sup>11</sup> Although the number of countries will likely remain roughly the same, the improvement in technology and increased numbers will pose significant increased risks to deployed U.S. forces beyond the year 2000. TMs are difficult to destroy because they can be launched covertly and have long ranges and short flight times. To date, our attack portion of TMD has been ineffective. It is a low cost high payoff way to influence the battlefield.

This paper has explained the importance of Theater Missile Defense and why future Operational Commanders must employ Joint Theater Missile Defense (TMD) forces to counter a growing threat. TMD will become one of the first functions to enter a theater prior to a buildup of combat power. The future is uncertain but it must be joint

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<sup>10</sup> US Army Space and Strategic Defense Command, USASSDC PAM10-1, *Army Theater Missile Defense Primer*, APR 96, page 35.

<sup>11</sup> *Ibid.*, page 6.

to be effective and must be planned and executed at the all levels of the theater, not just parceled out to subordinate commanders. We pieced together a make shift system for Desert Storm. We may not have that luxury again as our next opponent may not be so cooperative.

## **Bibliography**

Headquarters, Department of the Army, Deputy Chief of Staff for Operations and Plans, Force Development, Air & Missile Defense Division, *Cruise Missile Defense*, An Army White Paper, September 1996.

The Joint Staff, Joint Publication 3-01.5, *Doctrine for Joint Theater Missile Defense*, 22 FEB 96.

United States Army Air Defense Artillery School, FM 100-12, *Army Theater Missile Defense Operations*, Final Draft, FEB 96.

Headquarters, Department of the Army, Field Manual 44-91, *Theater High Altitude Area Defense, Battalion and Battery Operations*, 20 SEP 97.

ABL.1, Air Force Issues, United States Air Force Web Page.

United States Department of Defense pamphlet, *U.S. Ballistic Missile Defense Programs*, OCT 94.

US Army Space and Strategic Defense Command, USASSDC PAM10-1, *Army Theater Missile Defense Primer*, APR 96.

CDR Wayne F. Sweitzer, USN, *Battlespace Information, Command and Control (C2), Operational Intelligence, and Systems Integration*, JAN, 1998, Page 36.